Fisher® CV500 Rotary Control Valve

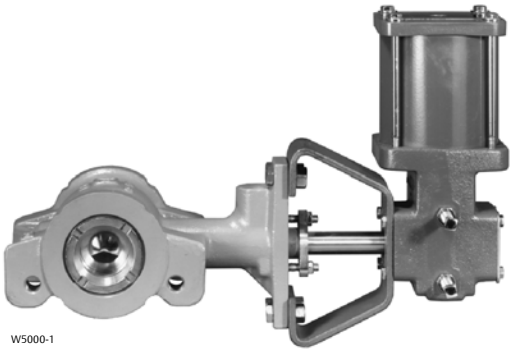
Contents

Introduction 1
Scope of Manual 1
Description 1
Specifications 2
Installation 3
Maintenance 8
Packing Maintenance 9
Stopping Leakage 9
Replacing Packing 9
Replacing Retainer, Seat Ring, and Face Seals 10
Disassembly 13
Assembly 13
Replacing Ball, Shaft, and Bearings 16
Disassembly 16
Assembly 19
Adjusting Actuator Travel 22
Changing Valve Flow Direction 23
Changing Actuator Mounting Style 23
Parts Ordering 24
Parts Kits 24
Parts List 26

Figure 1. Fisher CV500 Valve

W8192-2

FLANGED VALVE WITH FISHER 1052 ACTUATOR AND FIELDVUE™ DVC6200 DIGITAL VALVE CONTROLLER



W5000-1

WAFER VALVE WITH FISHER 1066 ACTUATOR

Introduction

Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts ordering information for NPS 3 through 12 Fisher CV500 Cam Vee-Ball™ rotary control valves. Refer to separate manuals for information concerning the actuator and accessories.

Description

The CV500 Cam-Vee-Ball rotary control valve, has a Vee-Ball style segmented ball in a valve body similar to the V500 valve. The CV500 is a flanged or wafer valve (figure 1) with a self-centering seat, eccentrically rotating V-notch ball, and splined valve shaft. Suitable for forward or reverse flow use, this valve mates with a variety of actuators to provide throttling or on-off service. Both flanged and wafer valves mate with ASME flanges or EN flanges.

Table 1. Specifications

Valve Sizes

■ NPS 3, ■ 4, ■ 6, ■ 8, ■ 10, and ■ 12

End Connection Style

■ Raised-face flanges or ■ ring-type joint flanges (ASME B16.5). Valve bodies with EN flanges also available. Various flangeless (wafer) valve body sizes are available in certain ASME and EN ratings. Consult your Emerson Process Management™ sales office

Maximum Inlet Pressure(1)

Consistent with applicable ASME B16.34 or EN 12516-1 ratings

Maximum Pressure Drops(1)

See tables 2 and 3

Shutoff Classification

Class IV per ANSI/FCI 70-2 and IEC 60534-4, (0.01% of valve capacity at full travel), for either flow direction

Flow Characteristic

Approximately equal percentage

Flow Direction

■ Forward (normal) flow is into the convex side of the V-notch ball

■ Bidirectional flow is into either side of the V-notch ball

Actuator Mounting

■ Right-hand or ■ left-hand as viewed from the upstream side of the valve

Mounting position depends on the desired open valve position and flow direction required by operating conditions

Valve Ball Rotation

Counterclockwise to close (when viewed from actuator side of valve body) through 90 degrees of ball rotation

Valve Body/Actuator Action

With diaphragm or piston rotary actuator, field-reversible between ■ push-down-to-close (extending actuator rod closes valve body) and ■ push-down-to-open (extending actuator rod opens valve body)

Shaft Diameters(2) and Approximate Weights

See table 3

1. The pressure/temperature limits in this manual and any applicable standard limitations should not be exceeded.
2. Shaft diameter and spline end must match available shaft diameter of actuator.

Do not install, operate, or maintain a CV500 valve without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your Emerson Process Management sales office before proceeding.

Specifications

Specifications for the CV500 rotary control valve are listed in table 1.

Table 2. Maximum Allowable Shutoff Pressure Drops(3)

VALVE BODY MATERIAL	BEARING MATERIAL	TEMPERATURE	VALVE SIZE, NPS					
			3	4	6	8	10	12
		°C	Bar					
WCC steel	S44004 (440C SST)	-29 to 149	41.4	41.4	41.4	24.1	24.1	27.6
		149 to 204	41.4	41.4	41.4	23.8	24.1	27.6
		204 to 316	41.4	41.4	41.4	23.1	24.1	27.6
WCC steel, EN 1.0619 steel, CF8M (316 SST), EN 1.4581 SST, or CF3M(4) (316L SST)	R30006 (Alloy 6)	-46(1) to 204	41.4	41.4	20.7	15.1	24.1	27.6
		204 to 260	41.4	41.4	20.7	15.1	24.1	27.6
		260 to 316	41.4	41.4	20.7	15.1	24.1	27.6
	PTFE/composition-lined S31603(2)(4) (316L SST)	-46(1) to 93	41.4	41.4	41.4	24.1	31	34.5
		93 to 149	41.4	41.4	41.4	24.1(5) 23.1(6)	31	34.5
		149 to 204	41.4	41.4	41.4	23.8(5) 22.1(6)	31	34.5
		204 to 260(2)	41.4	41.4	41.4	23.4(5) 21.7(6)	31	34.5
		°F	Psi					
WCC steel	S44004 (440C SST)	-20 to 300	600	600	600	350	350	400
		300 to 400	600	600	600	345	350	400
		400 to 600	600	600	600	335	350	400
WCC steel, EN 1.0619 steel, CF8M (316 SST), EN 1.4581 SST, or CF3M(4) (316L SST)	R30006 (Alloy 6)	-50(1) to 400	600	600	300	220	350	400
		400 to 500	600	600	300	220	350	400
		500 to 600	600	600	300	220	350	400
	PTFE/composition-lined S31603(2)(4) (316L SST)	-50(1) to 200	600	600	600	350	450	500
		200 to 300	600	600	600	350(5) 335(6)	450	500
		300 to 400	600	600	600	345(5) 320(6)	450	500
		400 to 500(2)	600	600	600	340(5) 315(6)	450	500

1. -29°C (-20°F) for WCC steel valve body material.
2. For hot water or steam service, limit maximum temperature to 260°C (500°F).
3. The pressure or temperature limits in this table or in any applicable code limitation, should not be exceeded.
4. Standard Fisher material offerings in Europe only.
5. S17400 (17-4PH SST) shaft only.
6. S20910 stainless steel shaft only. Pressure drops appropriate for both shaft materials.

Installation

⚠ WARNING

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

Personal injury or equipment damage caused by sudden release of pressure can result if the valve assembly is installed where service conditions could exceed the pressure drop limits given in table 2 or the valve rating. To avoid such injury or property damage, provide a relief valve for overpressure protection as required by government or accepted industry codes and good engineering practices.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

CAUTION

When ordered, the valve configuration and construction materials were selected to meet particular pressure, pressure drop, temperature, and controlled fluid conditions.

Responsibility for the safety of process media and compatibility of valve materials with process media rests solely with the purchaser and end-user. Since some valve body/trim material combinations are limited in their pressure drop and temperature range capabilities, do not apply any other conditions to the valve without first contacting your Emerson Process Management sales office.

Table 3. Shaft Diameters and Approximate Weights

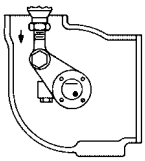
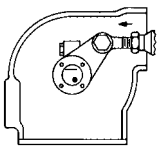
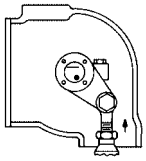
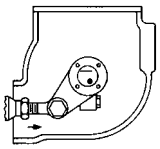
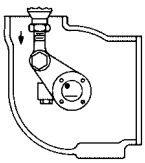
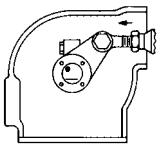
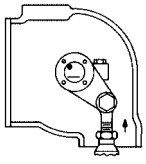
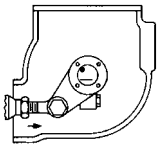
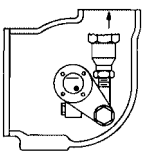
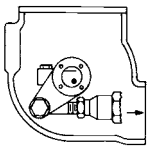
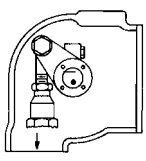
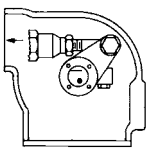
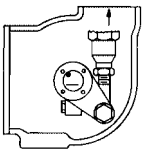
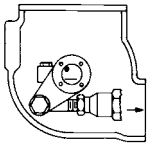
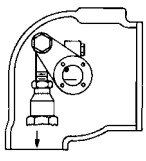
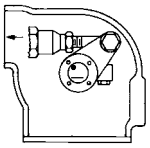
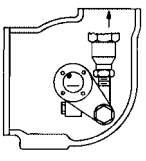
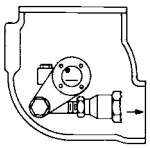
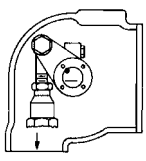
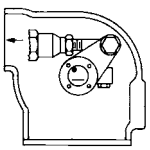
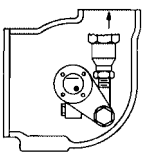
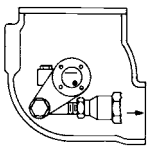
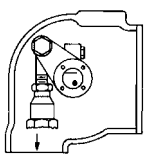
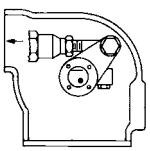
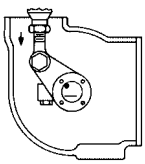
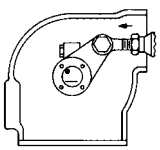
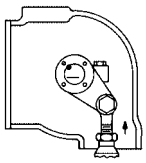
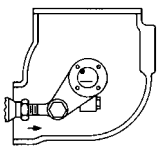
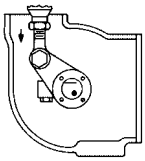
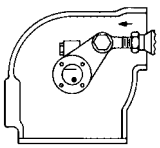
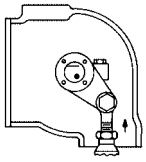
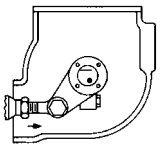
VALVE SIZE, NPS	SHAFT DIAMETERS		APPROXIMATE WEIGHTS					
			Flanged			Wafer		
	Through Valve Body	At Spline End(1)	CL150	CL300	CL600	CL150	CL300	CL600
	mm		kg			kg		
3	25.4	25.4	19	24	26	16	16	16
	25.4	19.1						
4	31.8	31.8	36	42	50	34	34	34
6	38.1	38.1	54	69	93	50	50	- - -
	38.1	31.8						
8	38.1	38.1	79	98	135	57	68	- - -
10	44.5	44.5	- - -	208	- - -	- - -	- - -	- - -
12	53.8	53.8	- - -	253	- - -	- - -	- - -	- - -
	53.8	50.8						
	Inches		Pounds			Pounds		
3	1	1	42	52	57	35	35	35
	1	3/4						
4	1-1/4	1-1/4	79	93	111	75	75	75
6	1-1/2	1-1/2	120	152	204	110	110	- - -
	1-1/2	1-1/4						
8	1-1/2	1-1/2	75	217	298	125	150	- - -
10	1-3/4	1-3/4	- - -	458	- - -	- - -	- - -	- - -
12	2-1/8	2-1/8	- - -	558	- - -	- - -	- - -	- - -
	2-1/8	2						

1. Spline diameter that connects to actuator versus shaft diameter.

Key numbers are shown in figure 10 for NPS 3 through 8 and in figure 11 for NPS 10 and 12.

1. If the valve body (key 1) is to be stored before installation, protect the flange mating surfaces and keep the valve body cavity dry and clear of foreign material.
2. Install a three-valve bypass around the control valve assembly if continuous operation will be necessary during inspection and maintenance of the valve.
3. A CV500 valve is normally shipped as part of a control valve assembly, with a power or manual actuator mounted on the valve. If the valve and actuator have been purchased separately or if the actuator has been removed from the valve, mount the actuator according to the actuator instruction manual. Also, adjust the actuator travel using the Adjusting Actuator Travel procedure in this manual before installing the valve; the required measurements cannot be made with the valve installed.
4. Before starting the actual installation of the valve, determine the proper installation orientation of the V-notch ball (key 2) and actuator. Determine the flow direction of the process fluid through the valve. See figure 2.

Figure 2. Index Marks for Actuator Lever Orientation

ACTUATOR MOUNTING	ACTUATOR STYLE	VALVE OPEN	ACTUATOR POSITION 1	2	3	4
RIGHT-HAND	STYLE A (PDTC)	F				
		R				
	STYLE B (PDTO)	F				
		R				
LEFT-HAND	STYLE C (PDTO)	F				
		R				
	STYLE D (PDTC)	F				
		R				

NOTES:
1. ARROW ON LEVER INDICATES DIRECTION OF ACTUATOR THRUST TO CLOSE VALVE.
2. PDTC=PUSH DOWN TO CLOSE; PDTO=PUSH DOWN TO OPEN.
3. F=FORWARD FLOW; R=REVERSE FLOW.

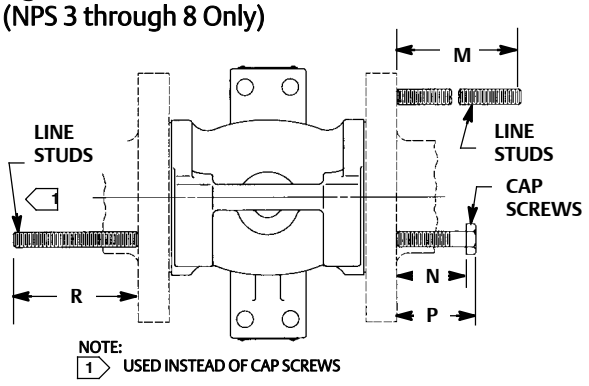
C0741

Line Studs (Key 36)

Valve Size, NPS	M(1)			
	PN	Qty	Bolt Size	Bolt Length, mm
3	PN 10-40	6	M16 x 2	260
	PN63	6	M20 x 2.5	300
	PN100	6	M24 x 3	325
4	PN10 and 16	6	M16 x 2	285
	PN25 and 40	6	M20 x 2.5	300
	PN63	6	M24 x 3	325
	PN100	6	M27 x 3	355
6	PN10 and 16	5	M20 x 2.5	350
	PN25 and 40	5	M24 x 3	375
8	PN10	10	M20 x 2.5	350
	PN16	10	M20 x 2.5	350
	PN25	10	M24 x 3	375
	PN40	10	M27 x 3	390
Valve Size, NPS	**CL**	**Qty**	**Bolt Size**	**Bolt Length, Inch**
3	150	4	5/8-11 UNC	10.62
	300	6	3/4-10 UNC	11.12
	600	6	3/4-10 UNC	11.50
4	150	6	5/8-11 UNC	11.44
	300	6	3/4-10 UNC	12.12
	600	6	7/8-9 UNC	13.62
6	150	5	3/4-10 UNC	13.62
	300	9	3/4-10 UNC	14.38
8	150	8	3/4-10 UNC	13.62
	300	10	7/8-9 UNC	15.38

1. These bolts may be installed from either end of the valve body.

Figure 3. Line Bolt Dimensions for Wafer Valves (NPS 3 through 8 Only)



Cap Screws (Key 37)

Valve Size, NPS	N				P
	PN	Qty	Bolt Size	Bolt Length, mm	Overall Length, mm
3	PN 10-40	4	M16 x 2	50	60
	PN63	4	M20 x 2.5	60	73
	PN100	4	M24 x 3	70	85
4	PN10 and 16	4	M16 x 2	50	60
	PN25 and 40	4	M20 x 2.5	60	73
	PN63	4	M24 x 3	70	85
	PN100	4	M27 x 3	80	97
Valve Size, NPS	**CL**	**Qty**	**Bolt Size**	**Bolt Length, Inch**	**Overall Length, Inch**
3	150	- - -	- - -	- - -	- - -
	300	4	3/4-10 UNC	2.38	2.88
	600	4	3/4-10 UNC	2.38	2.88
4	150	4	5/8-11 UNC	2.00	2.44
	300	4	3/4-10 UNC	2.38	2.88
	600	4	7/8-9 UNC	2.75	3.38

Line Studs (Key 36)(1)

Valve Size, NPS	R			
	PN	Qty	Bolt Size	Bolt Length, mm
6	PN10 and 16	6	M20 x 2.5	110
	PN25 and 40	6	M24 x 3	125
8	PN10	4	M20 x 2.5	110
	PN16	4	M20 x 2.5	110
	PN25	4	M24 x 3	125
	PN40	4	M27 x 3	135
Valve Size, NPS	**CL**	**Qty**	**Bolt Size**	**Bolt Length, Inch**
6	150	6	3/4-10 UNC	5.00
	300	6	3/4-10 UNC	5.00
8	150	- - -	- - -	- - -
	300	4	7/8-9 UNC	5.62

1. Use instead of cap screws.

Note

For control valves used in slurry service, mount the actuator and install the control valve so that the V-notch ball rotates above the valve drive shaft (refer to figure 2), if possible.

5. Before installing the valve, make sure the flow direction arrow (key 32) on the valve (key 1) matches the actual process fluid flow direction through the valve for the application where the valve will be installed.

Note

For best shutoff performance, install the valve with the drive shaft horizontal and the Vee-Ball closing in the downward direction for standard right hand mounting.

6. Install the flange gaskets and insert the valve between the mating pipeline flanges. For wafer valves, also make sure the mating line flanges are aligned. Use flat sheet gaskets compatible with the process media, or spiral wound gaskets with compression-controlling center rings.
7. For wafer valves, consult the line bolt clearances required (listed in figure 3) before installing the line bolts and nuts.

For all valves, install the line bolts and nuts; then, tighten them using accepted bolting procedures. These procedures include, but are not limited to, lubricating the line bolts and hex nuts and tightening the nuts in a crisscross sequence to ensure proper gasket load.

8. If a purge is desired for the purged bearing construction, remove the pipe plugs (keys 29 and 24) and install the purge lines. Purge pressure should be greater than the pressure within the valve and the purge fluid should be as clean as possible.

⚠ WARNING

A CV500 drive shaft is not necessarily grounded when installed in a pipeline unless the shaft is electrically bonded to the valve.

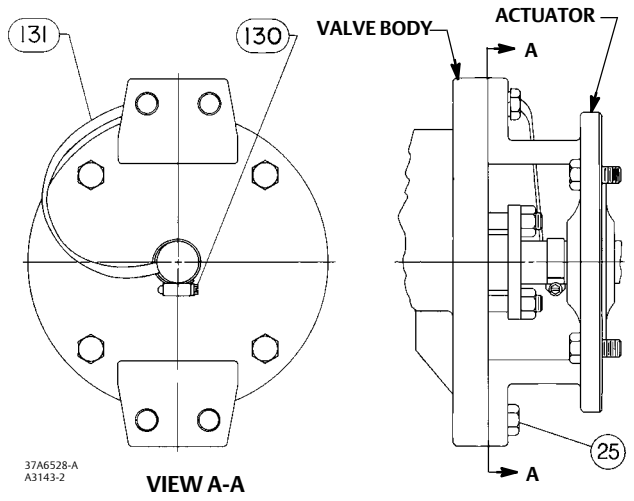
To avoid personal injury or property damage resulting from the effects of a static electricity discharge from valve components in a hazardous atmosphere or where the process fluid is combustible, electrically bond the drive shaft (key 3) to the valve according to the following step.

Note

Standard CV500 packings (key 13) are composed either entirely of conductive packing rings (graphite ribbon packing) or partially of conductive packing rings (a carbon-filled PTFE female adaptor with PTFE V-ring packing or a graphited-composition packing ring with PTFE/composition packing) in order to electrically bond the shaft to the valve body. Alternate shaft-to-valve body bonding is available for hazardous service areas where the standard packing is not sufficient to bond the shaft to the valve (see the following step).

9. For hazardous applications, attach the bonding strap assembly (key 131, figure 4) to the shaft with the clamp (key 130, figure 4) and connect the other end of bonding strap assembly to the valve body with the cap screw (key 25, figure 4).
10. Connect pressure lines to the actuator as indicated in the actuator instruction manual. When a manual actuator (handwheel) is used with a power actuator, install a bypass valve on the power actuator (if not already supplied) for use during manual operation.

Figure 4. Optional Shaft-to-Body Bonding Strap Assembly



⚠ WARNING

Personal injury could result from packing leakage. Valve packing was tightened before shipment; however, the packing might require some readjustment to meet specific service conditions. Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If the valve has ENVIRO-SEAL™ live-loaded packing installed, readjustment will probably not be required. See the instruction manual titled ENVIRO-SEAL Packing System for Rotary Valves for packing instructions. If you wish to convert your present packing arrangement to ENVIRO-SEAL packing, refer to the retrofit kits listed in the parts kit sub-section near the end of this manual.

Maintenance

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:

- **Do not remove the actuator from the valve while the valve is still pressurized.**
- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure on both sides of the valve. Drain the process media from both sides of the valve.**
- **Vent the power actuator loading pressure and relieve any actuator spring precompression.**
- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**
- **Always wear protective gloves, clothing, and eyewear when performing any maintenance operations.**
- **The valve packing area may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline.* Process fluids may spray out under pressure when removing the packing hardware or packing rings.**

- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

Valve parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions.

Packing Maintenance

Key numbers refer to figure 10 for NPS 3 through 8 and to figure 11 for NPS 10 and 12 unless otherwise indicated.

Note

For the ENVIRO-SEAL packing system, refer to the Parts List section for retrofit kits, parts kits, and individual parts (see figures 12 and 13). Refer to separate ENVIRO-SEAL instruction manual for maintenance instructions.

Standard ENVIRO-SEAL packing systems can be used in vacuum service with packing rings in the standard orientation. It is not necessary to reverse the ENVIRO-SEAL PTFE packing rings.

Stopping Leakage

All maintenance procedures in this section may be performed with the valve body (key 1) in the line.

For packings other than spring-loaded packing, leakage around the packing follower (key 14) may be stopped by tightening the packing flange nuts (key 16). If leakage cannot be stopped in this manner, replace the packing according to the Replacing Packing procedure in this manual.

If the packing is relatively new and tight on the drive shaft (key 3), and if tightening the packing nuts does not stop leakage, it is possible that the shaft is worn or nicked so that a seal cannot be made. If the leakage comes from the outside diameter of the packing, it is possible that the leakage is caused by nicks or scratches on the packing box wall. Inspect the shaft and packing box wall for nicks or scratches when performing the following procedures.

Replacing Packing

Note

If the valve has ENVIRO-SEAL live-loaded packing installed, see the manual entitled ENVIRO-SEAL Packing System for Rotary Valves.

This procedure may be performed without removing the actuator from the valve if adding PTFE/composition packing rings as a temporary measure. However, the actuator must be removed if replacing any other kind of packing or if the metal packing parts (keys 14, 17, and, if used, 18) need to be replaced.

⚠ WARNING

Refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. If using a power actuator, also shut-off all pressure lines to the power actuator, release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.

CAUTION

To avoid increased leakage, increased valve component wear or possible damage to the valve body, ball, shaft, and bearings resulting from a sharp blow to the shaft, use a wheel puller to separate the actuator parts from the drive shaft.

Do not drive the actuator parts off the drive shaft since this could move the valve bearings, shaft, and ball away from proper alignment, causing improper seating of the ball. Such misalignment may result in damage to valve components if the valve is returned to service without disassembly and inspection of the valve ball alignment.

2. If necessary, remove the cap screws (key 25) and hex nuts (key 26). Then remove the actuator while referring to the actuator instruction manual for assistance.
3. Remove the packing nuts (key 16). For NPS 3 through 8, remove the packing follower (key 14). For NPS 10 and 12, remove the packing flange (key 45) and then remove the packing follower (key 14).

CAUTION

In the following step, take care not to scratch the valve shaft or packing box wall, as this may cause leakage.

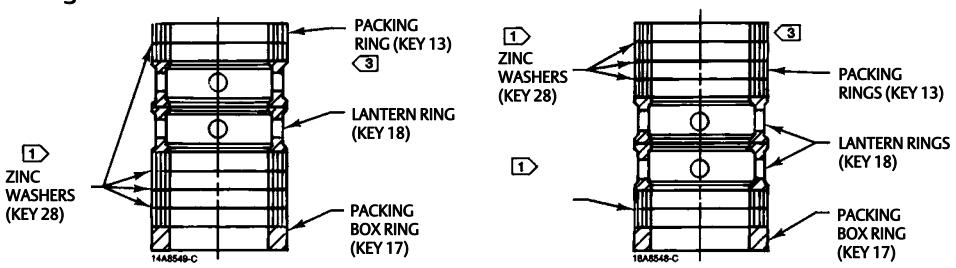
4. Remove the old packing rings (key 13), packing box ring (key 17), and, if used, the lantern ring (key 18). Do not scratch the valve shaft or packing box wall; scratching these surfaces could cause leakage. Clean all accessible metal parts and surfaces to remove particles that would prevent the packing from sealing.
5. Whenever you are installing new packing, be sure the ball (key 2) is closed while you install and tighten the new packing. Install the new packing rings and packing box ring by stacking the parts as shown in figure 5. Make sure split rings are arranged so that the splits do not line up to form a leak path. Then slide the stack into the packing box as far as they will go while being careful to avoid trapping air among the rings.
6. Install the packing follower (key 14), and, for NPS 10 and 12, also install the packing flange (key 45). Install the nuts (key 16), and tighten them far enough to stop leakage under normal conditions.
7. Mount the actuator while referring to the actuator mounting procedures in the actuator instruction manual. Complete the Adjusting Actuator Travel procedure in this manual before installing the valve in the pipeline. This is necessary due to the measurements that must be made during the actuator adjustment process.
8. When the control valve is being put back into operation, check the packing follower for leakage, and retighten the packing nuts as necessary.

Replacing Retainer, Seat Ring, and Face Seals

This procedure is to be performed if the control valve is not shutting off properly, if installing a different seat ring, or if seat ring inspection is necessary. The actuator and valve must be removed from the pipeline; however, the actuator may remain mounted during this procedure. Key numbers refer to figure 10 for NPS 3 through 8 and to figure 11 for NPS 10 and 12 unless otherwise indicated.

A retainer tool is required to remove the retainer (key 5). If specifically ordered, a tool is supplied with the valve; a tool can also be ordered individually by referencing key 33 of the Parts List. If desired, a tool can be machined using the dimensions shown in figure 6.

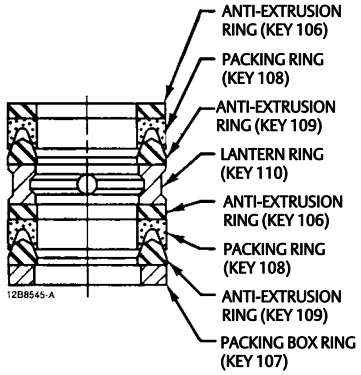
Figure 5. Packing Arrangements



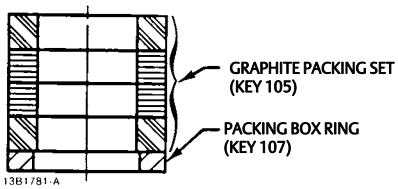
NOTES:
1 INCLUDES ZINC WASHERS (KEY 28) FOR GRAPHITE RIBBON PACKING ONLY
2 INCLUDED IN PTFE/V-RING PACKING SET (KEY 13).
3 FOR ONLY PTFE/BOUND-COMPOSITION PACKING, TOP RING IS CONDUCTIVE GRAPHITE FILAMENT RING.

C0587-4

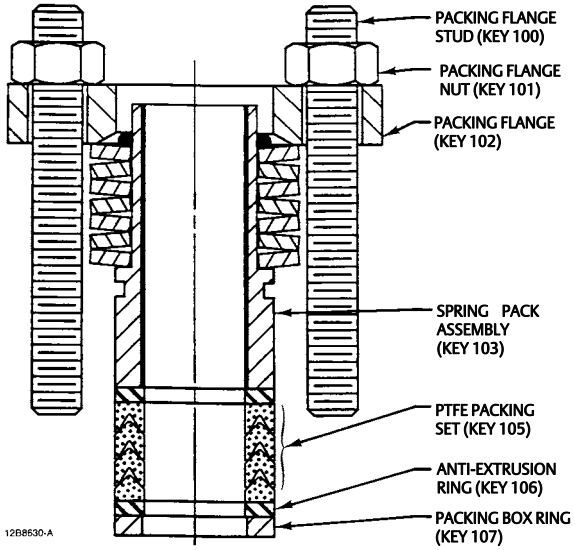
Figure 5. Packing Arrangements (Continued)



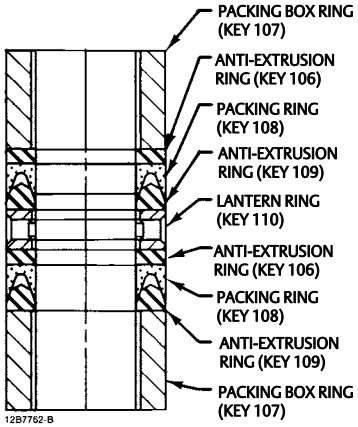
DOUBLE PTFE PACKING IN A STANDARD DEPTH BOX



GRAPHITE PACKING IN A STANDARD DEPTH BOX



SINGLE PTFE PACKING IN A STANDARD DEPTH BOX



DOUBLE PTFE PACKING WITH LEAKOFF AND IN A DEEP PACKING BOX

PTFE/COMPOSITION OR GRAPHITE ENVIRO-SEAL PACKING ARRANGEMENTS

CAUTION

During assembly, handle the retainer, seat ring, and face seals carefully. Critical areas that must be protected are the threads and inner surface of the retainer (key 5), the sealing surfaces of the face seals (key 8), the face seal grooves in the seat ring (key 4), the shutoff surface of the seat ring, and the face seal surface in the valve body.

A new retainer gasket (key 11) is required whenever the retainer (key 5) is removed. Other parts that are in good condition can be reused.

Disassembly

⚠ WARNING

Refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

Table 4. Assembly Clearance

PROCESS TEMPERATURE	SEAT RING AND RETAINER CLEARANCE			
	mm		Inches	
	Minimum	Maximum	Minimum	Maximum
To 260°C (500°F)(1)	0.08	0.30	0.003	0.012
Over 260°C (500°F)(2)	0.20	0.43	0.008	0.017

1. Standard Trim
2. Special High Temperature Trim

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. If using a power actuator, also shut-off all pressure lines to the power actuator, release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
2. Remove line bolting. Then, remove the control valve from the pipeline and place the valve on a flat surface with the retainer (key 5) facing up.
3. Rotate the drive shaft (key 3) to move the ball (key 2) into the open position.

Note
The retainer (key 5) was installed at the factory using the torque listed in figure 6.

CAUTION

After performing the following procedures, place the retainer, the seat ring, and both face seals on a protected, flat surface where the threads and inner surface will not be contaminated or damaged.

4. Remove the retainer (key 5) by engaging the retainer tool, attaching an impact wrench or other suitable tool, and unscrewing the retainer. Inspect the retainer. Place it on a protected, flat surface where the threads and inner surface will not be contaminated or damaged.
5. Remove the retainer gasket (key 11). Inspect the gasket surface in the valve body.
6. Lift out the seat ring (key 4) and both face seals (key 8). Inspect the parts and place them on a flat, protected surface.
7. Inspect the shutoff surface of the V-notch ball. If it is worn, nicked, or scratched, proceed to the Replacing Ball, Shaft, and Bearings procedure in this manual. If the parts are in good condition and do not require replacement, continue to the Assembly procedure in this manual.

Assembly

⚠ WARNING

Seat ring installation requires that the ball (key 2) remain in the open position.

The ball closes with a shearing, cutting motion, which could result in personal injury. To avoid personal injury or damage to tools, valve parts, or other items resulting from the ball closing, prevent against ball travel by using travel stops, manual actuators, constant supply pressure to a pneumatic actuator, or other steps as appropriate. When installing the seat ring, keep hands, tools, and other objects out of the valve.

1. Apply enough supply pressure to the actuator to open the ball, or take other steps to hold the ball open.
2. Clean the valve body, the retainer threads, the retainer gasket surface, and the seat ring sealing surface.
3. Using either face seals (key 8) in good condition or new face seals, place one seal in the seat ring cavity of the valve body.

Note

The seat ring (key 4) may have one or two shutoff surfaces. The shutoff surfaces are the narrow, rounded edges of the seat ring bore. Inspect the seat ring and locate the shutoff surfaces before proceeding.

Make sure the ball (key 2) is open while you install the seat ring (key 4) and retainer ring (key 5). Before installing the seat ring, open the ball or plug.

Insert a screwdriver, pry bar, or similar tool between the lower ear of the ball and the valve body. Use the pry to move the ball tightly against the thrust washer and bearing stop (key 7) on the actuator side of the valve. Keep the ball in that position until you finish installing the seat ring.

4. Insert the seat ring into the seat ring cavity with the correct shutoff surface facing the V-notch ball and shaft. The seat ring will cover the face seal installed in step 3.
5. Place the second face seal (key 8) on the seat ring (key 4).
6. Apply anti-seize lubricant to the gasket surface in the valve body. Install the gasket (key 11), while making certain that the concave surface of the gasket is up (hump surface of gasket down).
7. Apply anti-seize lubricant to the threads and bottom of the retainer (key 5) only in the area that contacts the gasket. Thread the retainer into the valve body.
8. Refer to figure 6. Find the correct retainer torque for the valve size. With the appropriate tool, tighten the retainer to the torque listed in figure 6.
9. A gap between the seat ring (key 4) and retainer (key 5) allows the seat ring to self-center. Applying the proper amount of torque during installation should position the retainer and seat ring properly. Use a feeler gage to measure between the parts as shown in figures 10 and 11, making certain the necessary clearance exists. Compare the measured gap to the clearance in table 4; proceed as follows:

- If the measured clearance is within table values, proceed to the next step.
- If the measured gap is larger than the maximum, tighten the retainer--apply more torque than that listed in figure 6, if necessary, until the clearance is within maximum and minimum values.
- If the measured clearance is smaller than the minimum, remove the retainer, seat ring, and face seals, clean the parts, and reassemble so as to obtain the necessary minimum clearance.

10. Perform the Adjusting Actuator Travel procedure in this manual and then install the control valve in the pipeline.

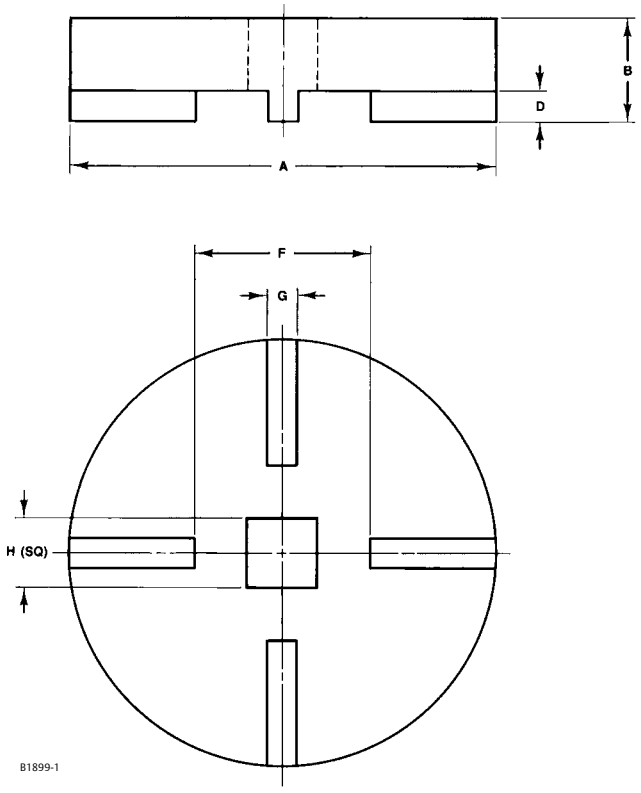
Table 5. Data for Making and Using the Retainer Tool

VALVE SIZE, NPS	A	B	D	F	G	H (SQUARE)	A	B	D	F	G	H (SQUARE)
	mm						Inches					
3	79.2	33.3	7.9	41.4	7.9	19.0	3.12	1.31	.31	1.62	.31	.75
4	104.6	33.3	7.9	41.4	7.9	25.4	4.12	1.31	.31	1.62	.31	1.00
6	155.4	38.1	11.2	63.5	11.2	25.4	6.12	1.50	.44	2.50	.44	1.00
8	203.2	50.8	11.2	101.6	11.2	38.1	8.00	2.00	.44	4.00	.44	1.50
10	241.3	50.8	11.2	127.0	19.1	38.1	9.5	2.00	.44	5.00	.75	1.50
12	273.0	50.8	11.2	127.0	25.4	38.1	10.75	2.00	.44	5.00	1.00	1.50

Table 6. Data for Making and Using the Retainer Tool

VALVE SIZE, NPS	RETAINER TORQUE	
	N•m	Lbf•ft
3	515	380
4	1170	860
6	2305	1700
8	3120	2300
10	4750	3500
12	6100	4500

Figure 6. Data for Making and Using the Retainer Tool



RETAINER TOOL FOR NPS 3 THROUGH 12 VALVES

Replacing Ball, Shaft, and Bearings

Perform this procedure to replace the ball (key 2), expansion pin (key 9), taper pin (key 10), drive shaft (key 3), follower shaft (key 38), groove pins (key 39), or bearings (keys 6 and 42). These parts are independently replaceable; for example, installing a new ball does not require replacing a reusable valve shaft or expansion pin assembly. For key numbers refer to figure 10 for NPS 3 through 8 and to figure 11 for NPS 10 and 12 unless otherwise indicated.

Disassembly

⚠ WARNING

To avoid personal injury resulting from contact with edges of the V-notch ball (key 2) and seat ring (key 4) during ball rotation, stay clear of its edges when rotating the ball. To avoid damage to tools, valve parts, or other items resulting from V-notch ball rotation, keep tools and other property away from the edges of the ball.

The ball closes with a shearing, cutting motion, which could result in personal injury. When the actuator is removed from the valve, the ball/shaft assembly may suddenly rotate, resulting in personal injury or property damage. To avoid injury or damage, carefully rotate the ball/shaft assembly to a stable position in the valve body after the actuator is disconnected.

CAUTION

To avoid increased leakage, increased valve component wear or possible damage to the valve body (key 1), ball (key 2), drive shaft (key 3), follower shaft (key 38), and bearings (keys 6 and 42) resulting from a sharp blow to the actuator or valve parts, use a wheel puller to separate the actuator parts from the valve drive shaft.

Do not drive the actuator parts off the valve drive shaft since this could move the valve bearings, shafts, and ball away from proper alignment, causing improper seating of the ball. Such misalignment may result in damage to valve components if the valve is returned to service without disassembly and inspection of the ball alignment.

⚠ WARNING

Refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

1. Isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. If using a power actuator, also shut-off all pressure lines to the power actuator, release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
2. Remove the actuator cover. Note the actuator orientation with respect to the valve body and the lever orientation with respect to the valve drive shaft (see figure 2). Remove the lever but do not loosen the actuator turnbuckle adjustment. Remove the actuator mounting screws and nuts, and remove the actuator. If necessary, refer to the actuator instruction manual for assistance.
3. With the valve body (key 1) out of the pipeline, loosen the packing nuts (key 16). If the packing is to be reused, do not remove it. However, Emerson Process Management recommends that the packing be replaced whenever the drive shaft is removed.

Table 7. Data for Tapped Holes on Valve Shaft

VALVE SIZE, NPS	SHAFT DIAMETER				THREAD SIZE, UNC
	Through Valve	At Spline End	Through Valve	At Spline End	
	mm		Inches		
3	25.4	25.4	1.00	1.00	3/8-16
	25.4	19.1	1.00	0.75	5/16-18
4	31.8	31.8	1.25	1.25	3/8-16
6	38.1	38.1	1.50	1.50	1/2-13
	38.1	31.8	1.50	1.25	3/8-16
8	38.1	38.1	1.50	1.50	1/2-13
10	44.5	44.5	1.75	1.75	1/2-13
12	53.8	53.8	2.12	2.12	3/4-10
	53.8	50.8	2.12	2.00	

4. Rotate the V-notch ball (key 2) to the fully open position.
5. Drive out the groove pin (key 39) that secures the ball (key 2) to the follower shaft (key 38). Remove the groove pin from the ball ear in the direction shown in figure 7.

Using a pin punch and hammer, firmly strike the chamfered end of the expansion pin through the smaller hole. You may need to bend the pin or drill the pin before it can be completely removed.

Remove both pins from the ball ear in the direction shown in figure 7. Driving the pins in the other direction will tighten the pins.

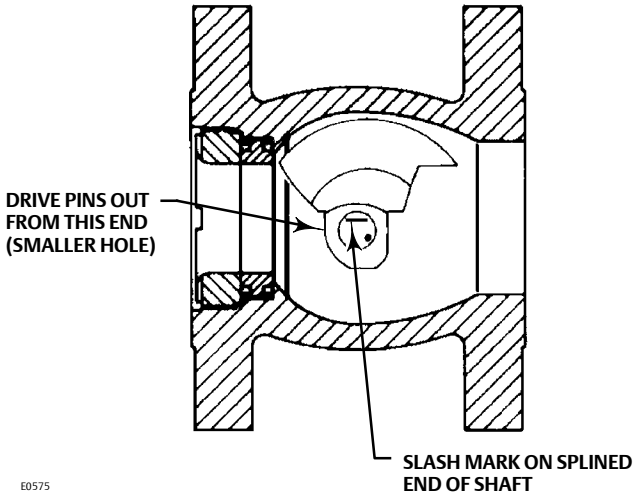
6. **For NPS 3 through 8,** remove the pipe plug (key 29). Using a punch, drive the follower shaft (key 38) into the center of the ball (key 2). Use care to avoid dropping the follower shaft.
7. **For NPS 10 and 12,** remove the hex nuts (key 44), and then remove the bottom flange (key 40). Thread a bolt into the end of the follower shaft and pull the follower shaft out of the valve. Refer to table 7 for thread sizes. The bearing (key 6) may come out with the follower shaft.
8. **For NPS 3 through 8,** refer to figure 7. The expansion pin (key 9) and the taper pin (key 10) inside of it are holding the ball in position on the drive shaft. Find the larger hole in the ball ear where these pins enter the ear. On the opposite side of the ear is a smaller hole where the chamfered end of the expansion pin rests on the inner lip of the hole.
9. **For NPS 10 and 12,** drive out the groove pin that secures the ball to the drive shaft. Remove the groove pin from the ball ear in the direction shown in figure 7.

⚠ WARNING

To avoid personal injury or damage to tools, valve parts, or other items resulting from the ball (key 2) falling from the valve body, support the ball to prevent it from falling as the drive shaft (key 3) is being removed.

10. Pull the drive shaft (key 3) from the valve body. If the shaft cannot be removed by hand, attach a slide hammer or similar tool to the spline end of the shaft that was attached to the actuator. If the shaft has a tapped hole at the spline end of the shaft, refer to table 7 for thread sizes.
11. Remove the ball (key 2), and thrust washers (key 12) from the valve body. (If using 17-7PH thrust washers there will be two, if using alloy 6 there will only be one thrust washer.)

Figure 7. Taper and Expansion Pin Removal from Ball and Drive Shaft



Note

For NPS 3 through 8, two shaft bearings (key 6) are located inside the valve body on either side of the ball. Only one of these two bearings is identified by key 6. The other bearing is located along the drive shaft on the other side of the V-notch ball.

For NPS 10 and 12, there are two shaft bearings. One is identified as key 6, and the other is identified as key 42.

12. If the shaft bearings are to be replaced, remove the packing (key 13).
13. If the bearing closest to the packing (key 6 on NPS 3 through 8 and key 42 on NPS 10 and 12) requires replacement and cannot be removed by hand, press it out using a ram with dimensions as given in figure 8. The ram has a smaller diameter than the bearing stop (key 7) so the bearing stop need not be removed when pressing out the bearing on the drive shaft. Insert the ram through the packing box and press the bearing into the valve body cavity. Take care not to move the bearing stop when pressing out the bearing.
14. **For NPS 3 through 8,** if the second bearing (key 6) requires replacement and cannot be removed by hand, use one of the following methods:

- Knock or pry the bearing out, or
- Use the valve drive shaft as a piston to drive the bearing from the valve body. To accomplish this, install the pipe plug (key 29). Fill the bearing bore with a heavy grease and then insert the end of the shaft back through the valve body and into the grease-filled bearing. Protect the splined end of the shaft with, for example, a block of wood; then strike the protected end. When the shaft is struck, it will act as a piston, pushing the grease into the bearing bore. The grease will then force the bearing out of the bore and farther along the shaft. Soon, the bearing will be positioned for easy removal.

15. **For NPS 10 and 12,** if the bearing (key 6) on the follower shaft requires replacement and cannot be removed by hand, press it out using a ram with dimensions as given in figure 8. Press the bearing into the valve body cavity.
16. If used, remove the O-rings (keys 19 and 20) from the bearings. Also, for NPS 3 through 8, remove the pipe plug (key 29).

Assembly

Note

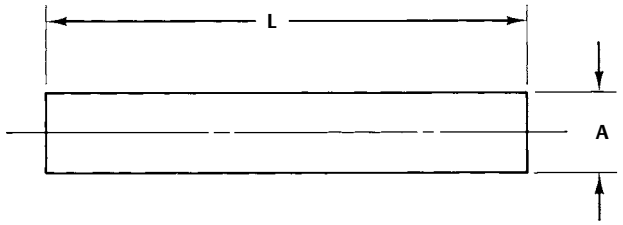
Before starting to assemble the valve components, place the valve body (key 1) on a flat surface with the retainer (key 5) facing down as shown in figure 9. This orientation of the valve allows easier installation of the V-notch ball.

1. Thoroughly clean the parts before assembly.

Table 8. Ram Dimension for Bearing Removal

VALVE SIZE, NPS	A MAX. / MIN.		L	
	mm	Inches	mm	Inches
3	27.8 / 27.4	1.094 / 1.078	165	6.50
4	34.1 / 33.7	1.344 / 1.328	165	6.50
6	42.1 / 41.7	1.656 / 1.641	197	7.75
8	42.1 / 41.7	1.656 / 1.641	229	9.00
10	48.4 / 48.0	1.905 / 1.890	229	9.00
12	57.8 / 57.4	2.275 / 2.260	260	10.25

Figure 8. Ram Dimension for Bearing Removal



2. If O-rings (keys 19 and 20) are used, apply a small amount of lubricant to the O-rings so the bearings will easily slide into the valve body. Insert the smaller O-ring (key 20) inside the bearing and the larger O-ring (key 19) around the outside of the bearing.

CAUTION

To avoid damage to O-rings resulting from contact with sharp edges within the bearing holes, use appropriate care when installing the O-rings.

3. Slide the bearing for the follower shaft (key 6) located opposite the packing box and, if used, O-rings (keys 19 and 20) into the valve body. For NPS 10 and 12, make certain the groove located on the outside diameter of the bearing is positioned towards the bottom flange side of the valve body.
4. Slide the bearing located on the packing box side (key 6 for NPS 3 through 8 and key 42 for NPS 10 and 12) into the valve body and against the bearing stop.

5. **For NPS 3 through 8,** inspect the drive shaft (key 3). Insert the shaft end opposite the splined end into the packing box and through the bearing that was previously installed in the packing box in step 4. Stop before the drive shaft enters the main valve body cavity. Support the splined end of the shaft.

For NPS 10 and 12, inspect the drive shaft (key 3). Insert the splined shaft end with the groove pin hole into the packing box and through the bearing that was previously installed in step 4. Stop before the drive shaft enters the main valve body cavity. Support the end of the drive shaft that extends out from the valve body.

6. **For NPS 3 and 4,** insert the follower shaft through the outside of the ear of the V-notch ball that has the smaller diameter (non-stepped) hole. Push the follower shaft through the ear until the end of the follower shaft with the groove pin hole is between the ears and the other end of the follower shaft is flush with the outside edge of the ear. Place the ball in the valve body cavity with the ear containing the follower shaft adjacent to the follower shaft bore. Slide the follower shaft through the ear of the ball and into the bearing (key 6) which was previously installed in step 3.

For NPS 6 and 8, locate the smaller diameter hole in the V-notch ball ear. Place the ball in the valve body cavity with the ear containing the smaller diameter hole adjacent to the follower shaft bore. Place the follower shaft between the ears of the ball. Slide the follower shaft through the ear of ball and into the bearing (key 6) that was previously installed in step 3.

For NPS 10 and 12, place the ball in the valve body cavity. Slide the follower shaft, splined end first, through the bearing (key 6) that was previously installed in step 3, and into the ear of the ball. Align the groove pin hole in the follower shaft with the hole in the ball ear.

7. **For NPS 3 through 8,** position the ball so that the larger hole is facing up, away from the seat ring and retainer. Determine the correct orientation of the V-notch ball (key 2) required by the specific installation orientation of the valve and the flow direction of the process fluid. See figure 2.

For NPS 10 and 12, determine the correct orientation of the V-notch ball (key 2) required by the specific installation orientation of the valve and the flow direction of the process fluid. See figure 2. The groove pin hole in both the drive shaft (key 3) and the ear of the ball are offset from center. Make certain the holes will align.

Note

Before proceeding, inspect the V-notch ball position once again to ensure the correct orientation. If the ball is not properly installed, it will not rotate properly and will not shutoff in service.

8. Hold the thrust washer (key 12) between the ball (key 2) and the bearing installed next to the packing (key 6 for NPS 3 through 8 and key 42 for NPS 10 and 12).

Note

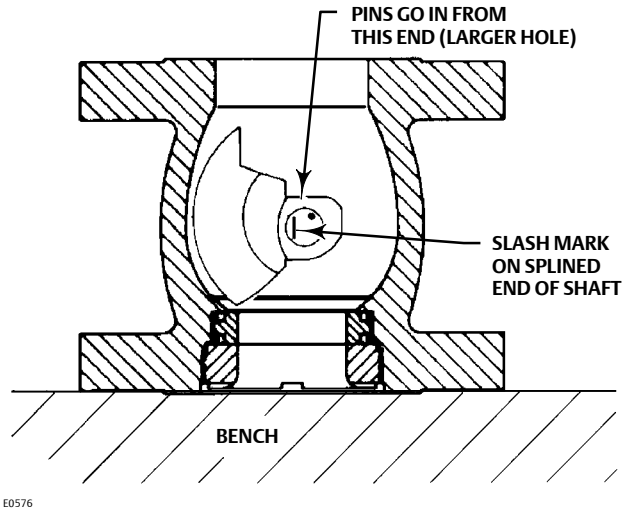
To obtain the correct thickness, two thrust washers (key 12) are needed when using 17-7PH. When using alloy 6, only one thrust washer is needed to get the correct thickness.

For NPS 10 and 12, align the zero mark located on the end of the drive shaft with the zero mark located on the ball ear.

For all sizes, slide the valve drive shaft (key 3) from the packing box into the valve body through the thrust washer and into the ear of the ball.

9. **For NPS 3 through 8,** secure the ball in the correct open position. Locate the slash mark on the splined end of the valve drive shaft. Rotate the drive shaft until the slash mark is vertical and facing out from the center of the shaft in the same direction as the ball seating surface. See figure 9.

Figure 9. Taper and Expansion Pin Insertion into Ball and Drive Shaft



Note

When the valve drive shaft is correctly positioned for NPS 3 through 8, the slash mark on the splined end will be parallel with the ball shutoff surface. See figure 9. If the ball is not properly aligned with the slash mark, the valve will not function correctly.

Step 9 is not required for NPS 10 and 12 because the drive shaft and the ear of the ball are both splined and were aligned in step 8.

10. Secure the ball to the follower shaft by aligning the groove pin hole in the ball ear and the hole on the opposite side of this ear with the groove pin hole through the follower shaft (key 38).
11. Use pin punches to drive in the groove pin until it is flush with the surface of the ball ear. Stake both ends of the pin hole in the ball ear to retain the pin during this step.
12. Secure the ball to the drive shaft (key 3) as follows:

- For NPS 3 through 8:

    a. The holes in both the drive shaft (key 3) and the ear of the ball are offset from center. Make certain the holes in the ear of the ball will align with the hole in the drive shaft.

Note

If the holes in the ball ear do not line up with the hole in the drive shaft, check the slash mark on the splined end of the shaft. Make sure the shaft and ball are properly oriented.

    b. Place the chamfered end of the expansion pin (key 9) into the larger hole in the ball ear (see figure 9).

CAUTION

To avoid damage to the expansion pin, ball, or drive shaft resulting from the application of excessive force on the expansion pin, use appropriate care when driving the expansion pin through the ball and drive shaft. Use the correct tool. Do not use excessive force.

c. Drive the expansion pin into the larger hole until the chamfered end of the pin reaches the inner lip of the smaller hole on the opposite side of the ball. Closely observe the progress of the pin to avoid striking it after it has reached the lip of the smaller hole.

d. Place the taper pin (key 10) into the open end of the expansion pin. Drive the taper pin into the expansion pin until the pins, ball, and drive shaft are snug. Do not attempt to drive either pin flush with the ear.

- **For NPS 10 and 12,** the groove pin holes in both the drive shaft (key 3) and the ear of the ball are offset from center and have spline ridges. Make certain the holes in the ear of the ball will align with the hole in the drive shaft. Secure the ball to the drive shaft by using pin punches and driving in the groove pin until it is flush with the surface of the ball ear. Make certain that the groove pin goes completely through the drive shaft and into the opposite side of the ball ear.

13. Rotate the ball by hand to check that it rotates properly. If rotation interferes with the valve body, drive out the taper and expansion pins (keys 9 and 10) for NPS 3 through 8 and the groove pin (key 39) that fastens the drive shaft to the ball for NPS 10 and 12. Remove the drive shaft (key 3), and repeat this procedure starting with step 5.
14. **For NPS 3 through 8,** install the pipe plug (key 29).
15. **For NPS 10 and 12,** install the gasket (key 41), bottom flange (key 40), and then install and tighten the hex nuts (key 44). Make sure the pipe plug (key 29) is installed in the bottom flange.
16. If the seat ring (key 4), face seals (key 8), and retainer (key 5) need to be installed, complete the Assembly portion of the Replacing Retainer, Seat Ring, and Face Seals procedure in this manual. If the seat ring has previously been installed, proceed to Adjusting Actuator Travel in this manual. If the packing has been removed, be sure to refer to the Packing Maintenance procedures in this manual to replace the packing before installing the actuator on the valve.

Adjusting Actuator Travel

Perform this procedure whenever the actuator is removed or disconnected from the valve and whenever the seat ring and retainer (keys 4 and 5) are removed. Too little actuator travel will increase shutoff leakage; too much travel will cause excessive ball and seat ring torque and wear.

Any of the Fisher pneumatic, electric, electrohydraulic, or manual actuators--or any other actuator--must be adjusted for use with a CV500 valve so that the ball is rotated to the fully closed position. A gap of approximately 0.0254 mm (0.001 inch) for temperatures to 260°C (500°F) or 0.1524 mm (0.006 inch) for higher temperatures measured between the seat ring (key 5) and retainer (key 4) indicates the fully closed position.

Note that this gap is also measured when assembling the seat ring, retainer, and face seals to ensure correct assembly. Measure the gap according to this procedure to ensure proper actuator adjustment. Merely completing the assembly measurement is not sufficient.

Travel adjustments vary with the type of actuator (some use turnbuckle assemblies; some use externally adjusted travel stops; others use internal limit switches). Refer to the actuator instruction manual for adjustment instructions.

Note

When mounting the actuator, be sure the ball (key 2) is closed. Do not use a hammer or other tool to drive the actuator lever onto the valve shaft. Clean the valve shaft and actuator lever splines to be sure the actuator lever will slide on easily.

If the lever does not slide on easily, carefully wedge the ball solidly against the actuator-side thrust washer using a screw driver or similar tool in the same location as the pry bar in the installation. Keep the wedge in place while installing the lever, but again, do not drive on the lever.

Remove the wedge after you have clamped the actuator lever on the valve shaft and connected the lever to the actuator piston rod or diaphragm rod.

1. Mount the actuator following the instructions in the actuator instruction manual. Refer to figure 2 to select actuator mounting style and position and to orient the actuator lever with the valve drive shaft (key 3).
2. For actuators with clamped levers, pull the drive shaft (key 3) by hand toward the packing (key 13) so that the ball (key 2) and thrust washer (key 12) are tight against the bearing closest to the packing (key 6 for NPS 3 through 8 and key 42 for NPS 10 and 12). Clamp the lever to the valve drive shaft.

CAUTION

Do not apply full actuator signal (pressure or power) to the actuator in the next step. A full signal may wedge the ball into the seat ring. Use a regulated signal source and gradually increase the signal to slowly stroke the actuator.

3. Adjust the actuator travel and stroke the actuator so that the ball is close to but not contacting the seat ring at full actuator travel. If available on electric actuators, use the manual handwheel to position the plug.
4. Adjust the travel, using a full actuator signal, until the ball contacts the seat ring around its full circumference. This contact self-centers the seat ring on the V-notch ball.
5. Continue to adjust the travel until a gap of approximately 0.0254 mm (0.001 inch) exists between the seat ring and retainer, as shown in figure 11, at full actuator travel.
6. Refer to the actuator instruction manual to lock the actuator travel adjustment.

Changing Valve Flow Direction

The CV500 valve may be installed in either forward or reverse flow service. Standard flow direction is forward flow enters the seat ring first, then flows past the V-notch ball. If changing flow direction is necessary, release all pressure from the valve and actuator. Remove the control valve assembly from the pipeline and rotate the assembly about the valve drive shaft to put the retainer end of the valve where the other end was. Refer to the procedure for changing actuator mounting style if the actuator must be repositioned, and refer to the installation section to install the control valve assembly. Be sure to reposition the flow direction arrow on the valve.

Changing Actuator Mounting Style

Refer to figure 2 of this manual and the actuator instruction manual when changing mounting styles or positions. Right-hand mounting places the actuator on the right side of the valve as viewed from the upstream side of the valve; left-hand mounting places the actuator on the left side of the valve. Remember that the upstream side of the valve inlet is the retainer end of the valve body for forward flow and the other end of the valve body is the upstream side for reverse flow.

Complete the Adjusting Actuator Travel procedure in this manual whenever the actuator is removed.

Parts Ordering

A serial number is assigned to each valve body and stamped on the nameplate. Always refer to this serial number when corresponding with your Emerson Process Management sales office regarding spare parts or technical information. When ordering replacement parts, also specify the complete 11-character part number from the Parts List.

⚠ WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.

Parts Kits

Repair Kits

Repair kits include recommended spares for standard and sealed bearing constructions.

VALVE SIZE, NPS		REPAIR KIT NUMBER
3 4 6 8		RV500X00042 RV500X00052 RV500X00062 RV500X00072
Parts Included in Kits		**Quantity in Kit**
Key Number	**Description**	
9	Expansion pin	1
10	Taper pin	1
11	Retainer gasket	1
19	O-ring (sealed bearing only)	2
20	O-ring (sealed bearing only)	2

Retrofit Kits for ENVIRO-SEAL Packing

Retrofit kits include parts to convert existing CV500 valves with single depth packing box to the ENVIRO-SEAL packing box construction. Retrofit kits include single PTFE or graphite packing box construction (see the following table).

VALVE SIZE, NPS	SHAFT DIAMETER		PART NUMBER	
	mm	Inches	Single PTFE	Graphite
3	25.4	1	RRTYXRT0052	RRTYXRT0352
4	31.8	1-1/4	RRTYXRT0062	RRTYXRT0362
6 & 8	38.1	1-1/2	RRTYXRT0072	RRTYXRT0372
10	44.5	1-3/4	RRTYXRT0682	RRTYXRT0822
12	53.8	2-1/8	RRTYXRT0722	RRTYXRT0862

Parts Included in Kits			Quantity in Kit	
Key	Description		Single PTFE	Graphite
100	Packing Stud	Packing Stud	2	2
101	Packing Nut	Packing Nut	2	2
102	Packing Flange	Packing Flange	1	1
103	Spring Pack Assembly	Spring Pack Assembly	1	1
105	Packing Set	Packing Set	1	1
106	Anti-Extrusion Washer	Anti-Extrusion Washer	2	- - -
107	Packing Box Ring	Packing Box Ring	1	1

Repair Kits for ENVIRO-SEAL Packing

Packing boxes in these valves may be deep drilled. If the valve body being repaired has a deep packing box, additional parts are required. Refer to the Packing Maintenance section in this manual.

VALVE SIZE, NPS	SHAFT DIAMETER		PART NUMBER	
	mm	Inches	PTFE	Graphite
3	25.4	1	RRTYXRT0052	13B8816X092
4	31.8	1-1/4	RRTYXRT0062	13B8816X112
6 & 8	38.1	1-1/2	RRTYXRT0072	13B8816X142
10(1)	44.5	1-3/4	RRTYXRT0232	13B8816X152
12(1)	53.8	2-1/8	RRTYXRT0252	13B8816X182
Parts Included in Kits			Quantity in Kit	
Key Number	Description			
105	Packing Set	Packing Set	1	1
106	Anti-Extrusion Washer	Anti-Extrusion Washer	2	- - -(2)

1. Order individual parts from the Parts List.
2. Included in packing set key 105.

Parts List

Note
Part numbers are shown for recommended spares only. For part numbers not shown, contact your Emerson Process Management sales office.

Valve Body (figures 10 and 11)

Key	Description	Part Number
1	Body/Bearing Assembly Keys 1 and 7 are included in the valve body/bearing assembly. If a part number is required, contact your Emerson Process Management sales office for assistance	---
2	Ball	
3	Drive Shaft	
4*	Seat Ring, Full Port/Metal Seat	See following table
5	Retainer Ring	
6*	Bearing (2 req'd)	See following table
7	Bearing Stop	
8*	Face Seal, (2 req'd)	
	Metal	
	NPS 3	19A3716X012
	NPS 4	19A3680X012
	NPS 6	19A4243X012
	NPS 8	19A3649X012
	NPS 10	12B6851X012
	NPS 12	12B3366X012
	PTFE	
	NPS 3	10B9118X012
	NPS 4	10B9119X012
	NPS 6	10B9120X012
	NPS 8	10B9121X012
9*	Expansion Pin, S20910	
	NPS 3	19A3717X012
	NPS 4	19A3681X012
	NPS 6 & 8	19A3687X012
10*	Taper Pin, S20910	
	NPS 3 F14114X0012	
	NPS 4 16A5515X012	
	NPS 6 & 8	H13748K0032
11*	Retainer Gasket	
	Use w/metal seat construction only	
	316 SST	
	NPS 3	19A5198X012
	NPS 4	19A5199X012
	NPS 6	19A5200X012
	NPS 8	19A6401X012
	NPS 10	12B6852X012
	NPS 12	12B3365X012
	S31603(1) (316L SST)	
	NPS 3	19A5198X032
	NPS 4	19A5199X042
	NPS 6	19A5200X032
	NPS 8	19A6401X032
	NPS 10	12B6852X022
	NPS 12	12A3365X022
12	Thrust Washer (2 req'd for 17-7PH)(1) (1 req'd for alloy 6)	
13*	Packing Set, w/PTFE V-rings and w/one carbon-filled (conductive) PTFE ring, (see figure 5). For single packing arrangement (1 set req'd), also used with purged bearing construction. For double packing box const., (2 sets req'd).	
	Packing set w/conductive V-ring	
	NPS 3	12A8832X022
	NPS 4	12A8951X022
	NPS 6 & 8	12A8935X022
	NPS 10	12A9057X022
	NPS 12	1R5162X0012
	Packing set w/non-conductive V-ring	
	NPS 3	12A8832X012
	NPS 4	12A8951X012
	NPS 6 & 8	12A8935X012
	NPS 10	12A9057X012
	NPS 12	1R516201012
	Braided PTFE/composition and Graphite Rings (see figure 5) For single packing arrangements, order 3 braided PTFE composition rings, and 1 graphite filament ring as listed below. Also use w/purged bearing constructions. For double packing arrangements, order 5 braided PTFE composition rings, and 1 graphite filament ring	
	NPS 3	
	Ring, braided PTFE composition	14A0915X012
	Ring, graphite filament	14A0915X042
	NPS 4	
	Ring, braided PTFE composition	14A0916X012
	Ring, graphite filament	14A0916X072
	NPS 6 & 8	
	Ring, braided PTFE composition	14A1933X012
	Ring, graphite filament	14A1933X022
	NPS 10	
	Ring, braided PTFE composition	12A9158X012
	Ring, graphite filament	12A9158X032
	NPS 12	
	Ring, braided PTFE composition	1P925001042
	Ring, graphite filament	1P9295X0092
13*	Packing Set, (cont'd)	
	Graphite Ribbon Rings (see figure 5) For single packing arrangements, order 4 graphite ribbon rings (key 13), and 3 packing washers (key 28) Also use w/purged bearing constructions. For double packing arrangements, order 6 graphite ribbon rings (key 13), and 4 packing washers (key 28).	
	NPS 3	
	Ring, graphite ribbon	12A9137X012
	Packing washer (key 28)	14A8365X012
	NPS 4	
	Ring, graphite ribbon	12A9138X012
	Packing washer (key 28)	14A8366X012
	NPS 6 & 8	
	Ring, graphite ribbon	12A9139X012
	Packing washer (key 28)	14A8367X012
	NPS 10	
	Ring, graphite ribbon	12A9140X032
	Packing washer (key 28)	14A9772X012
	NPS 12	
	Ring, graphite ribbon	1V949601652
	Packing washer (key 28)	12B5927X012

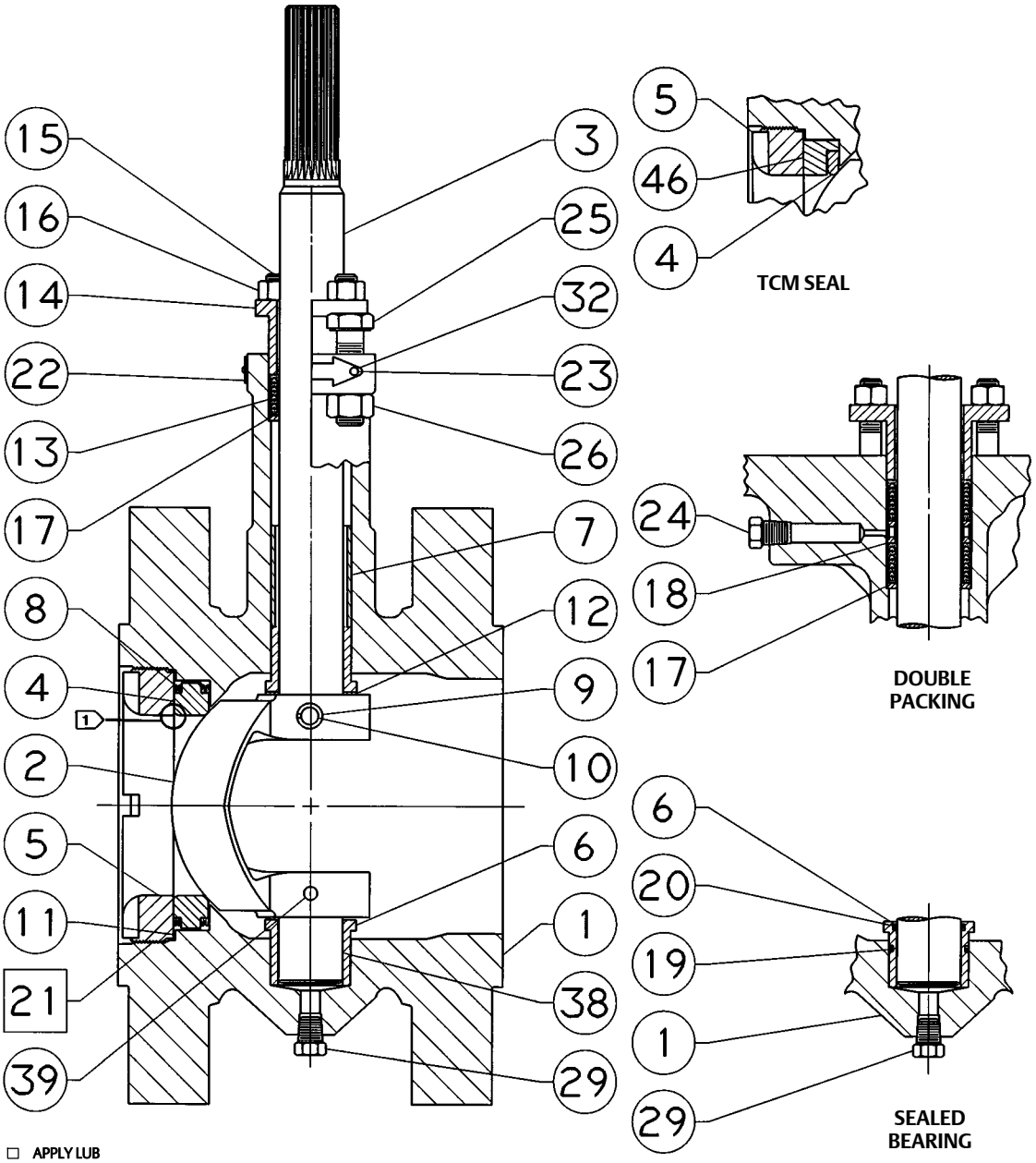
*Recommended spare parts
1. A single quantity of the part number is needed - you will receive two thrust washers when you specify 17-7PH.

Key	Description	Part Number
14	Packing Follower	
15	Packing Flange Stud	
16	Packing Flange Nut	
17*	Packing Box Ring	
	Use w/all packing box constructions	
	316 SST	
	NPS 3	16A6085X012
	NPS 4	16A6086X012
	NPS 6 & 8	16A6087X012
	NPS 10	12A9058X052
	NPS 12	12B3373X012
	S31603(2) (316L SST)	
	NPS 3	16A6085X062
	NPS 4	16A6086X082
	NPS 6 & 8	16A6087X072
	NPS 10	12A9058X062
	NPS 12	12B3373X022
18	Lantern Ring	
19*	O-Ring (for sealed bearings, 2 req'd)	
	Nitrile	
	NPS 3	10A3804X012
	NPS 4	1W1932X0022
	NPS 6 & 8	13A2331X022
	NPS 10	12A9480X012
	NPS 12	19A3772X052
	Fluorocarbon	
	NPS 3	10A3804X032
	NPS 4	1W1932X0032
	NPS 6 & 8	13A2331X012
	NPS 10	12A9480X022
	NPS 12	19A3772X022

Key	Description	Part Number
20*	O-Ring (for sealed bearings, 2 req'd)	
	Nitrile	
	NPS 3	10A8217X042
	NPS 4	10A3803X012
	NPS 6 & 8	1F1153X0012
	NPS 10	1P1676X0012
	NPS 12	10A3556X042
	Fluorocarbon	
	NPS 3	10A8217X012
	NPS 4	10A3803X032
	NPS 6 & 8	1F1153X0022
	NPS 10	1P1676X0022
	NPS 12	10A3556X032
21	Anti-seize lubricant	
22	Identification Nameplate	
23	Drive Screw	
24	Pipe plug	
25	Cap Screw	
26	Hex Nut	
28*	Packing Washer (not shown) (Refer to key 13, Packing Rings and Washer (key 28) for application requirements)	
29	Pipe Plug	
30	Nameplate	
32	Flow Arrow	
33	Retainer Tool (Not Shown)	
36	Stud	
37	Cap Screw	
38	Follower Shaft	
39	Groove Pin	
40	Bottom Flange	
41*	Gasket, S31603	
	NPS 10	12B6856X012
	NPS 12	12B3368X012
42*	Drive Bearing	See following table
43	Stud (for bottom flange bolting)	
44	Hex Nut (for bottom flange bolting)	
45	Packing Flange	
130	Clamp (Req'd w/non-conductive packing)	
131	Bonding Strap Assembly (Req'd w/non-conductive packing)	

*Recommended spare parts
2. Standard Fisher material offering in Europe only

Figure 10. Fisher CV500 Valve, NPS 3 Through 8



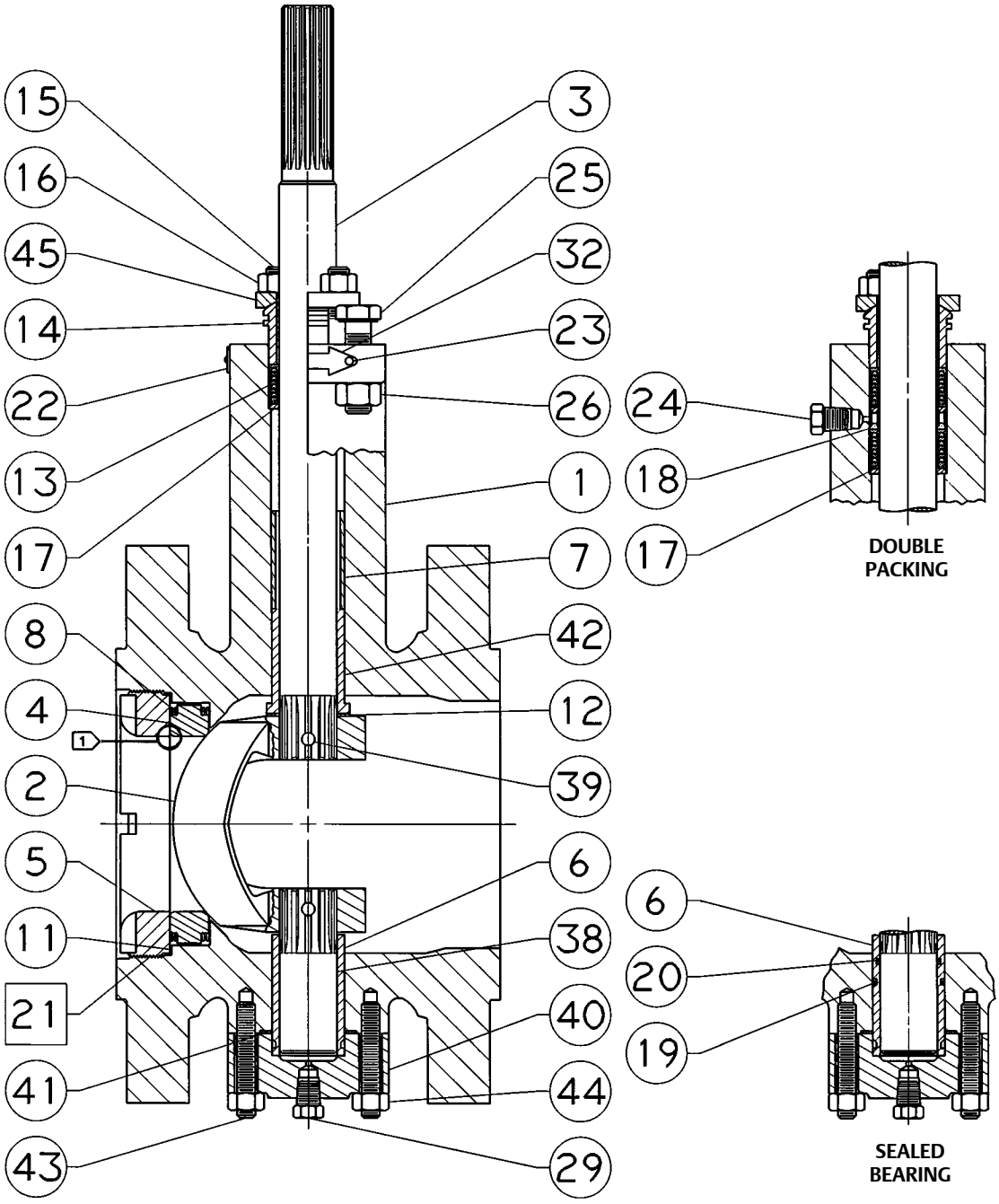
□ APPLY LUB

KEY NUMBERS NOT SHOWN ARE 28, 30, 31, 33, 36, 37, 130, AND 131

NOTE:
1 MEASURE GAP HERE

42B3374-A

Figure 11. Fisher CV500 Valve, NPS 10 and 12

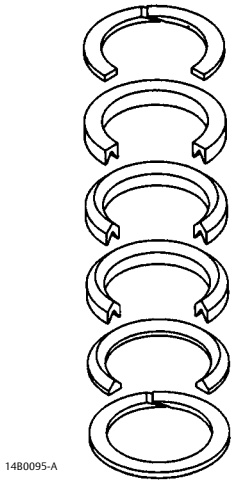


□ APPLY LUB
KEY NUMBERS NOT SHOWN ARE 28, 30, 31, 33, 36, 37, 130, AND 131

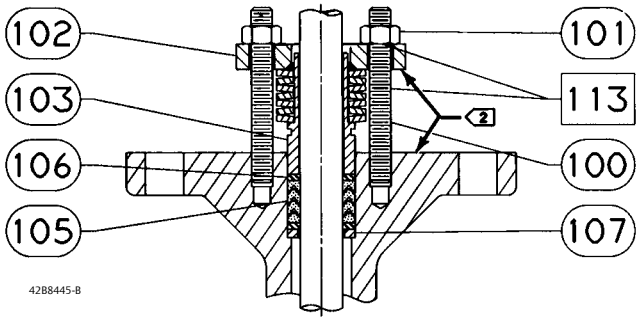
NOTE:
1 MEASURE GAP HERE

42B5286-A

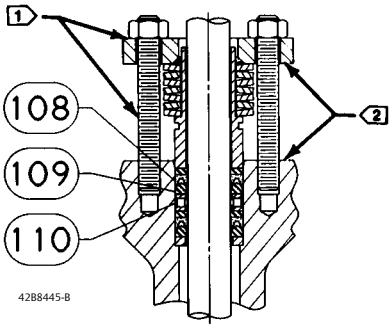
Figure 12. Typical ENVIRO-SEAL Rotary Packing Arrangements with PTFE Packing



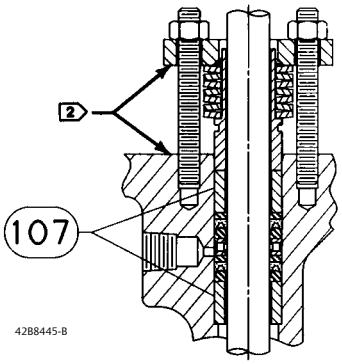
STACKING ORDER OF
PTFE PACKING RINGS



SINGLE PTFE PACKING
STANDARD DEPTH BOX



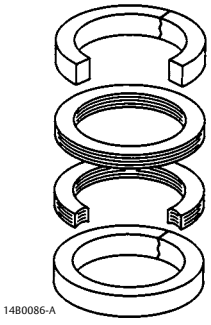
DOUBLE PTFE PACKING
STANDARD DEPTH PACKING BOX



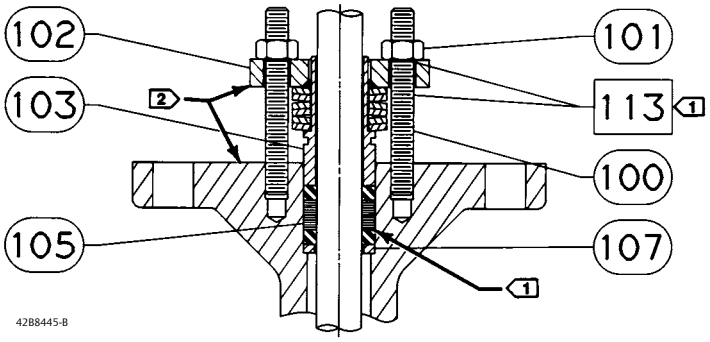
DOUBLE PTFE PACKING WITH LEAKOFF
OPTIONAL DEEP PACKING BOX

NOTES:
1 APPLY LUBRICANT.
2 THESE TWO SURFACES SHOULD REMAIN PARALLEL AS YOU ALTERNATELY AND EVENLY TIGHTEN THE PACKING NUTS (KEY 101).

Figure 13. Typical ENVIRO-SEAL Rotary Packing Arrangements with Graphite Packing



STACKING ORDER OF
GRAPHITE PACKING RINGS



GRAPHITE PACKING
STANDARD DEPTH BOX

NOTES:
1 APPLY LUBRICANT.
2 THESE TWO SURFACES SHOULD REMAIN PARALLEL AS YOU ALTERNATELY AND EVENLY TIGHTEN THE PACKING NUTS (KEY 101).

ENVIRO-SEAL Packing System (figures 12 and 13)

Key	Description	Part Number
100	Packing Flange Stud	
101	Packing Flange Nut	
102	Packing Flange	
103	Spring Pack Assembly	
105*	Packing Set	
	PTFE	
	NPS 3	12B7438X012
	NPS 4	12B7450X012
	NPS 6 & 8	12B7462X012
	NPS 10	14B3049X012
	NPS 12	14B3203X012
	Graphite	
	NPS 3	13B8816X092
	NPS 4	13B8816X112
	NPS 6 & 8	13B8816X142
	NPS 10	13B8816X152
	NPS 12	13B8816X182
106*	Anti-Extrusion Ring, Composition/graphite filled PEEK(1) (2 req'd)	
	Single PTFE packing w/std packing box	
	NPS 3	12B7442X012
	NPS 4	12B7454X012
	NPS 6 & 8	12B7466X012
	NPS 10	14B3045X012
	NPS 12	14B3199X012
	Double PTFE packing w/std & deep pkg box	
	NPS 3	12B7442X012
	NPS 4	12B7454X012
	NPS 6, 8, 10, & 12 (not available)	
107*	Packing Box Ring	
	Single PTFE packing	
	Standard packing box	
	NPS 3	16A6085X012
	NPS 4	16A6086X012
	NPS 6 & 8	16A6087X012
	NPS 10	12A9058X012
	NPS 12	12B3373X012
	Double PTFE packing	
	Standard packing box	
	NPS 3	16A6085X012
	NPS 4	16A6086X012
	NPS 6, 8, 10, & 12 (not available)	
	Deep packing box (2 req'd)	
	NPS 3	12B7448X012
	NPS 4	12B7460X012
	NPS 6, 8, 10, & 12 (not available)	
	Graphite Packing	
	Standard packing box	
	NPS 3	16A6085X012
	NPS 4	16A6086X012
	NPS 6 & 8	16A6087X012
	NPS 10	12A9058X012
	NPS 12	12B3373X012
108*	Packing Ring	
	Double PTFE packing w/standard and	
	NPS 3	12A8831X022
	NPS 4	12A8953X022
	NPS 6, 8, 10, & 12 (not available)	
109*	Anti-Extrusion Ring	
	Double PTFE packing w/standard and w/deep packing box (2 req'd)	
	NPS 3	12B7446X012
	NPS 4	12B7458X012
	NPS 6, 8, 10, & 12 (not available)	
110	Lantern Ring	
111	Tag	
112	Cable Tie	
113	Lubricant	

Key 4* Seat Ring—Full Port, Use w/Metal Seal Construction

VALVE SIZE, NPS	MATERIAL				
	CF8M (316 SST)	CF3M(1) (316L SST)	R30006 (Alloy 6)	CF8M w/CoCr-A Seat	CF3M(1) w/CoCr-A Seat
3	29A3703X012	29A3703X092	29A3703X022	---	---
4	29A3667X012	29A3667X102	29A3667X022	---	---
6	29A4230X012	29A4230X092	29A4230X032	29A4231X012	29A4231X032
8	29A3635X012	29A3635X082	29A3635X022	29A3636X012	29A3636X022
10	22B6836X022	22B6836X032	22B6836X012	22B6837X012	22B6837X022
12	22B3357X022	22B3357X032	22B3357X012	22B5924X012	22B5924X022

1. Standard Fisher material offering in Europe only.

*Recommended spare parts
1. PEEK stands for poly-ether-ether-ketone

Key 6* Bearings for NPS 3 Through 8 Valves (2 required)

VALVE SIZE, NPS	BEARING TYPE	BEARING MATERIAL		
		S44004 (440C)	R30006 (Alloy 6)	PTFE/Composition Lined S31603 (316L SST)
3	Standard(1)	19A3713X012	19A5184X012	19A3715X132
	Sealed	19A3714X012	29A5185X012	- - -
4	Standard(1)	19A3677X012	19A5187X012	19A3679X152
	Sealed	19A3678X012	29A5188X012	- - -
6	Standard(1)	19A4239X012	19A5190X012	19A4241X132
	Sealed	19A4240X012	29A5191X012	- - -
8	Standard(1)	19A3645X012	19A5193X012	19A3647X132
	Sealed	19A3646X012	29A5194X012	- - -

1. Also use for purged bearing constructions.

Key 6* Follower Bearing for NPS 10 and 12 Valves

VALVE SIZE, NPS	BEARING TYPE	BEARING MATERIAL		
		S44004 (440C)	R30006 (Alloy 6)	PTFE/Carbon Lined S31603 (316L SST)
10	Standard(1)	12B6847X012	12B6847X022	12B6845X012
	Sealed	22B6848X022	22B6848X012	- - -
12	Standard(1)	12B5291X012	12B5291X022	12B5288X012
	Sealed	22B3370X022	22B3370X012	- - -

1. Also use for purged bearing constructions.

Key 42* Drive Bearing for NPS 10 and 12 Valves

VALVE SIZE, NPS	BEARING TYPE	BEARING MATERIAL		
		S44004 (440C)	R30006 (Alloy 6)	PTFE/Composition Lined S31603 (316L SST)
10	Standard(1)	12B6843X012	12B6843X022	12B6841X012
	Sealed	22B6844X022	22B6844X012	- - -
12	Standard(1)	12B5290X012	12B5290X022	12B5282X012
	Sealed	22B3371X022	22B3371X012	- - -

1. Also use for purged bearing constructions.

*Recommended spare parts

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

Fisher, Vee-Ball, FIELDVUE, and ENVIRO-SEAL are marks owned by one of the companies in the Emerson Process Management business division of Emerson Electric Co. Emerson Process Management, Emerson, and the Emerson logo are trademarks and service marks of Emerson Electric Co. All other marks are the property of their respective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Emerson Process Management
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Chatham, Kent ME4 4QZ UK
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.Fisher.com

©Fisher Controls International LLC 1991, 2011; All Rights Reserved